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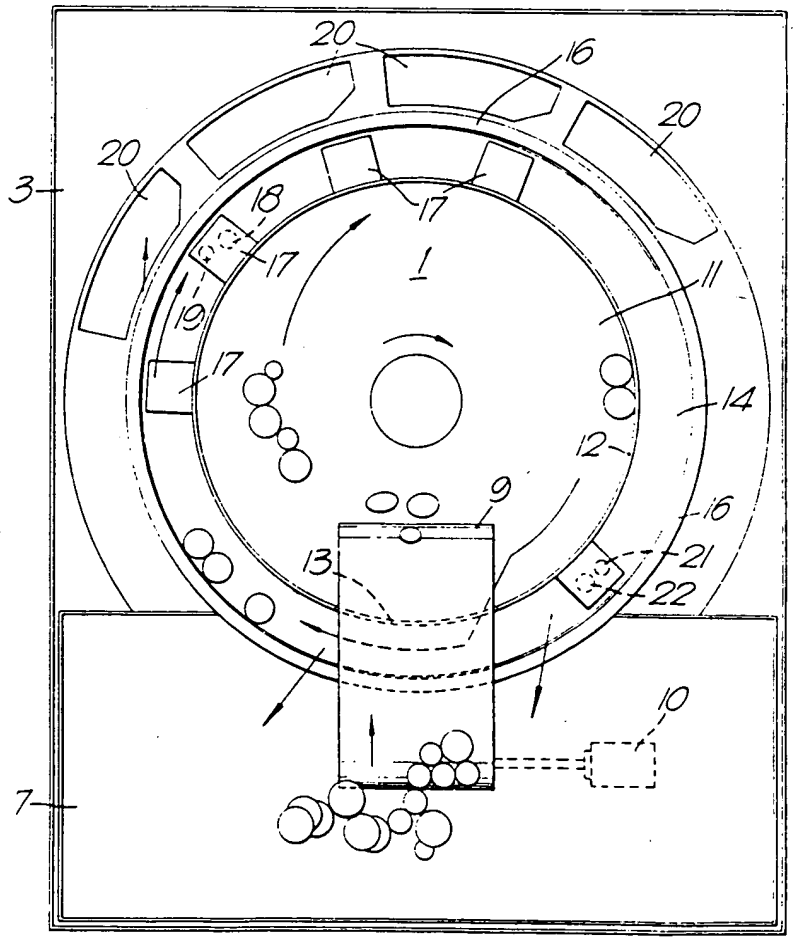
(54) **Sorting and other selection of articles**

(57) Coin to be sorted is discharged onto a rotating horizontal disc (1) to be urged, after passage through a separation slot (13) of a wear strip (12), against the upstanding rim (16) of the disc (1). In one machine (Figures 1 to 6) an annular ferromagnetic element (14), providing the peripheral margin of the disc (1) within the rim (16), has flexural freedom so that transitory energization of a solenoid (18, 21) below the disc (1) from a coin sensor (19, 22) above, attracts a localized region of the element (14) downwardly. Any coin lying in the deflected region is lifted free of the obstructing rim (16) upon the return, upward overswing of the element (14) to pass from the disc (1) into an outlet port (20). The lifting of the coin above the rim (16) is alternatively achieved in a second machine (Figures 9 to 15) by ferromagnetic finger-elements (64) which are pivotally mounted side-by-side beneath the peripheral margin of the disc (41) and around its entire circumference. Energization of the solenoid (58) in this case causes the finger-elements (64) which are passing over, to pivot and thereby project through a gap between the peripheral margin and the rim (52) so as to tip the overlying coin over the rim (52).

Fig.1.



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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

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Fig.1.

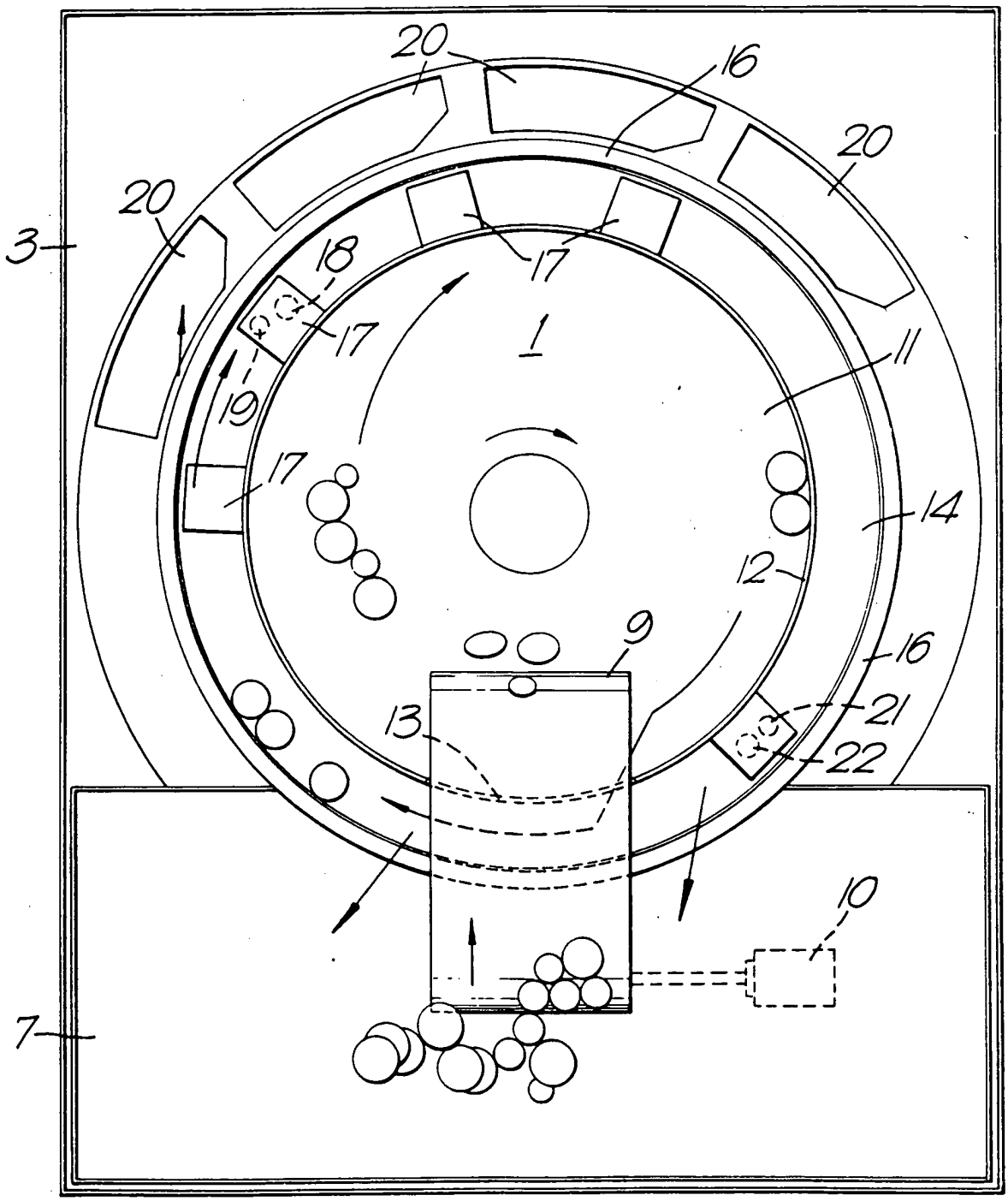


Fig. 2.

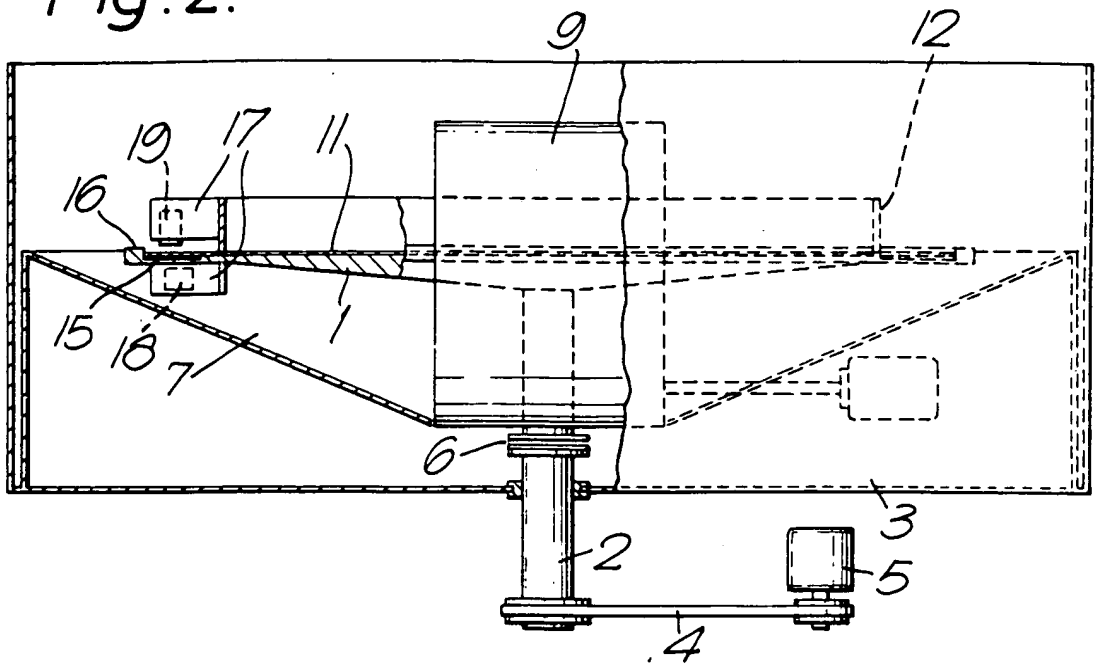


Fig. 3.

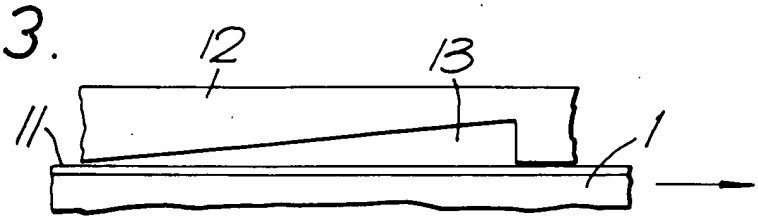


Fig. 4.

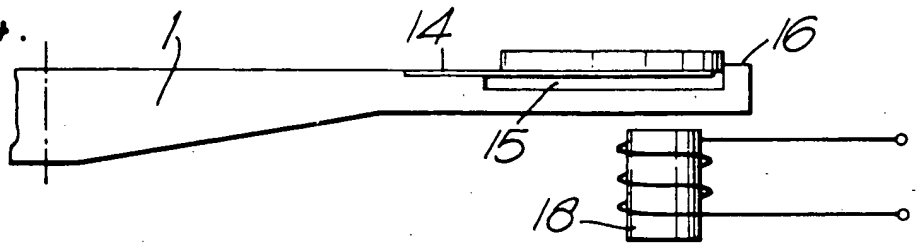


Fig. 5.

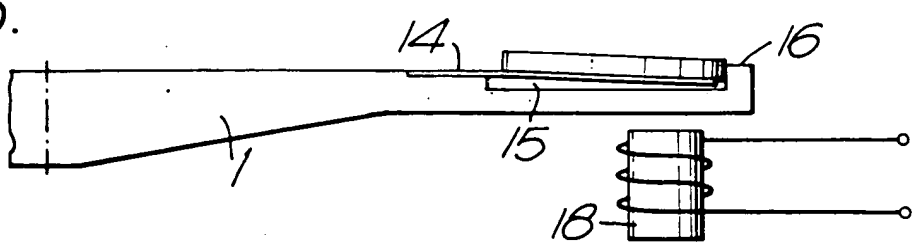
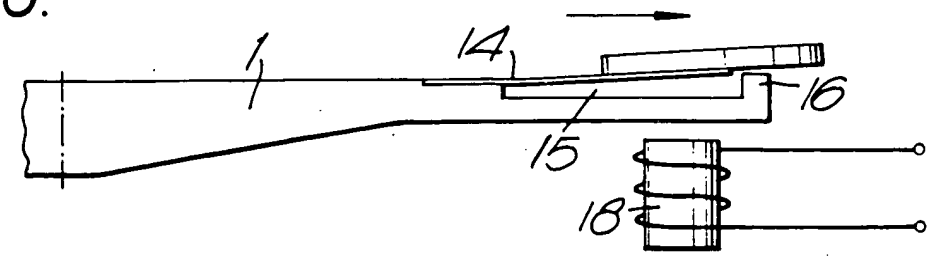


Fig. 6.



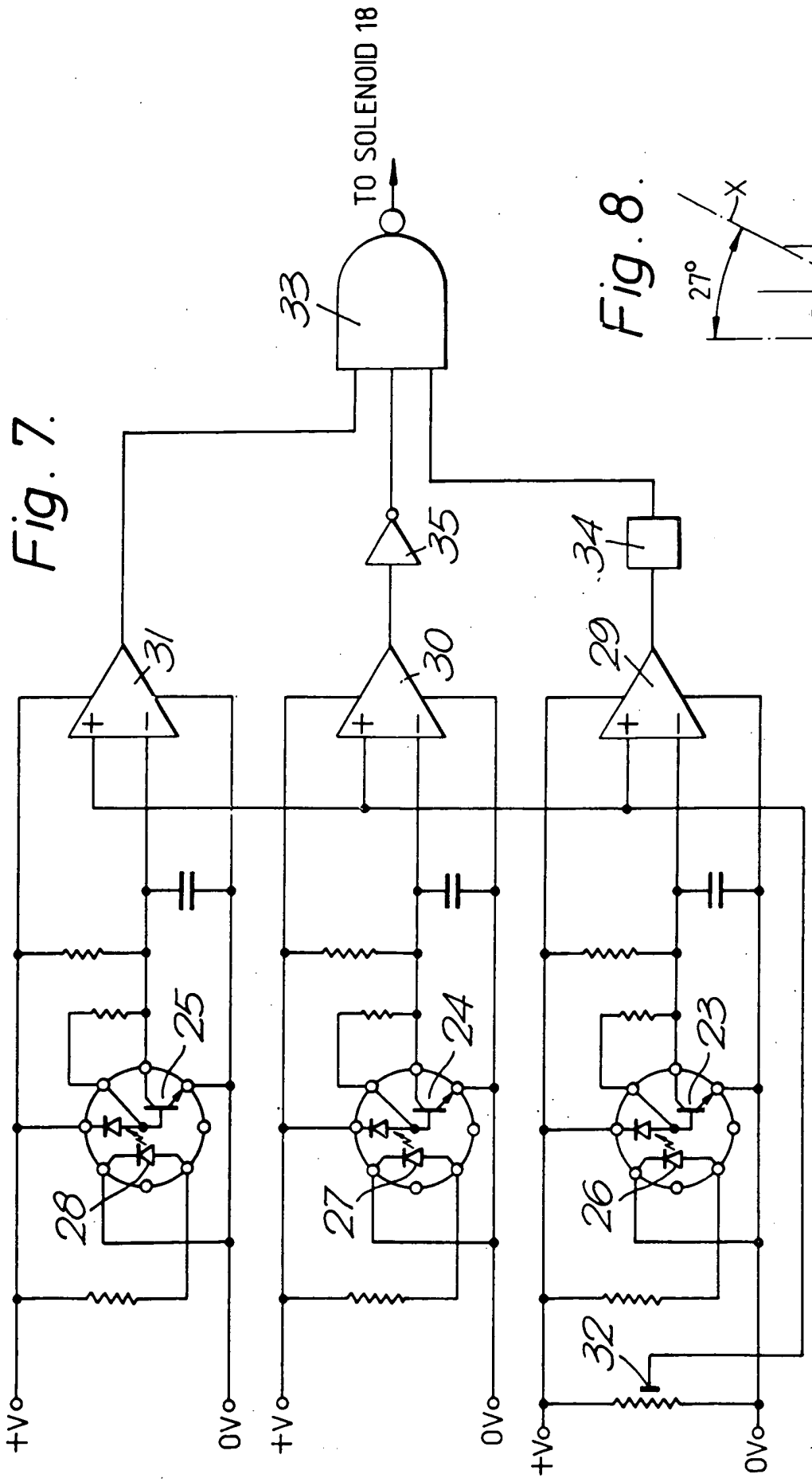

TO SOLENOID 18
33
35
34
31
30
29
25
24
23
28
27
26
32
+V
0V
+V
0V
+V
0V

Fig. 7.

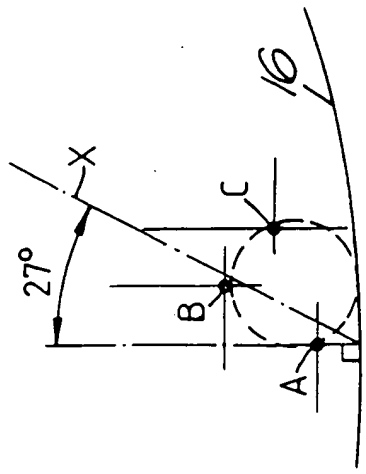

16
X
27°
C
B
A

Fig. 8.

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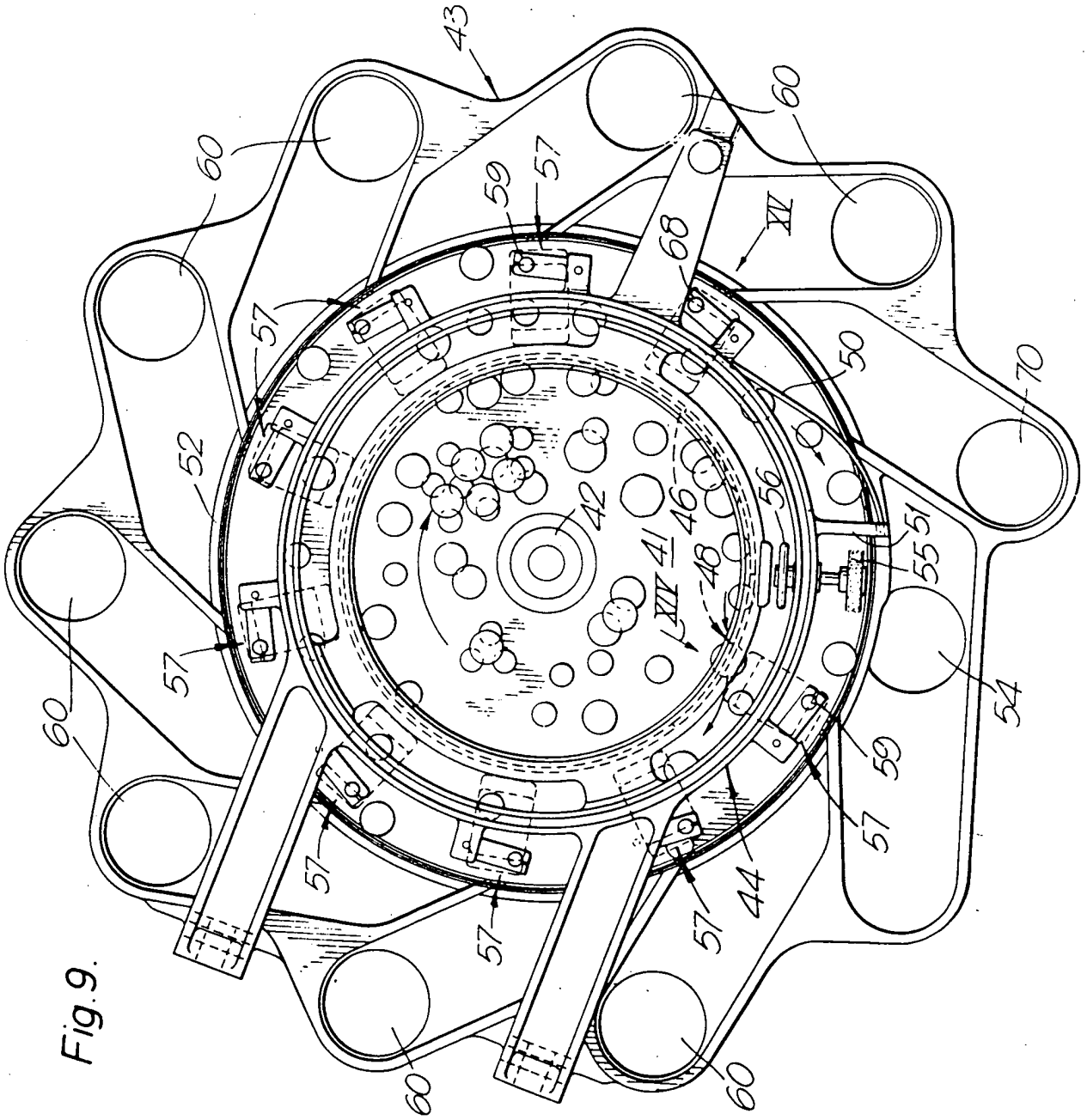

Fig.9.

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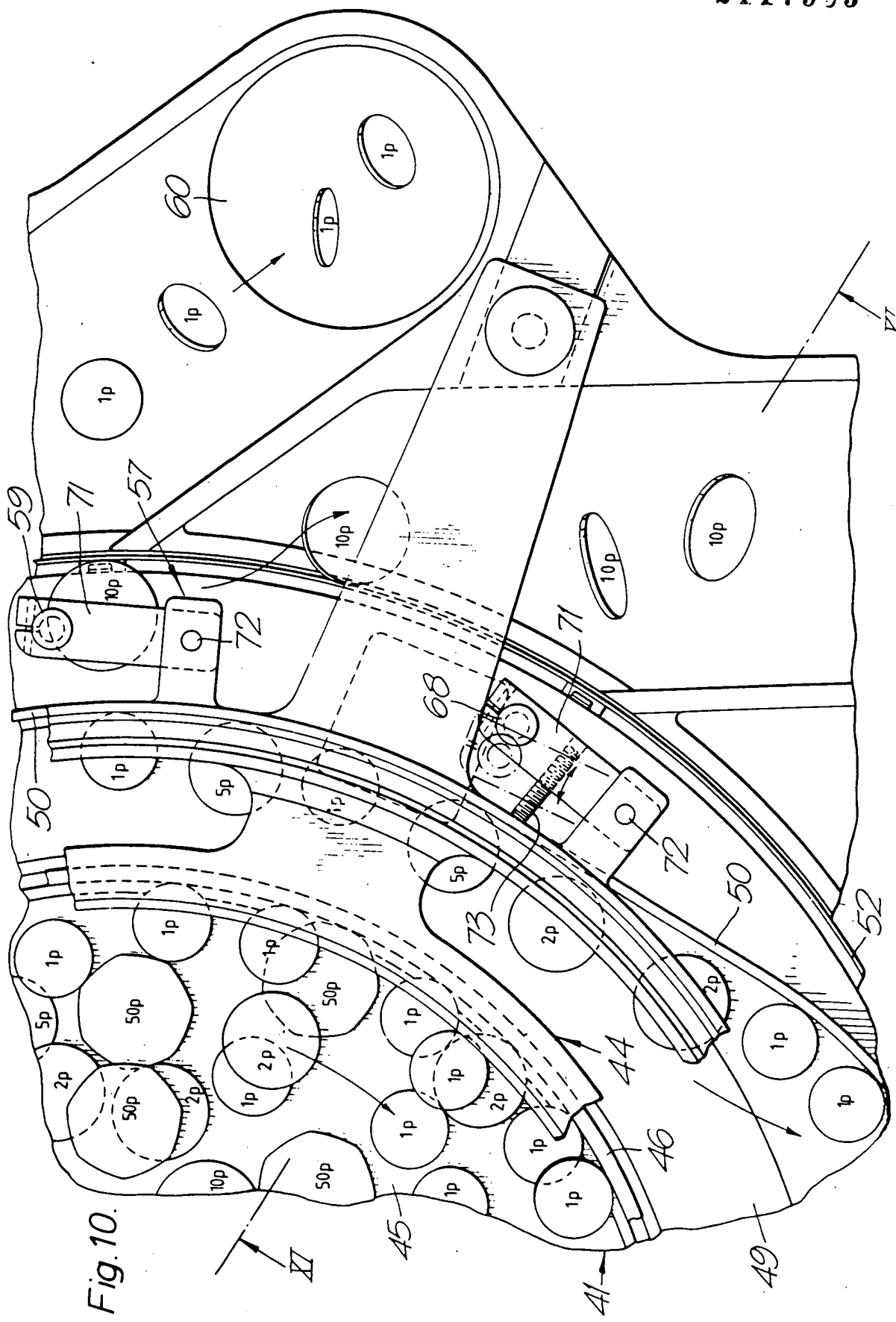


Fig. 10.

Fig.11.

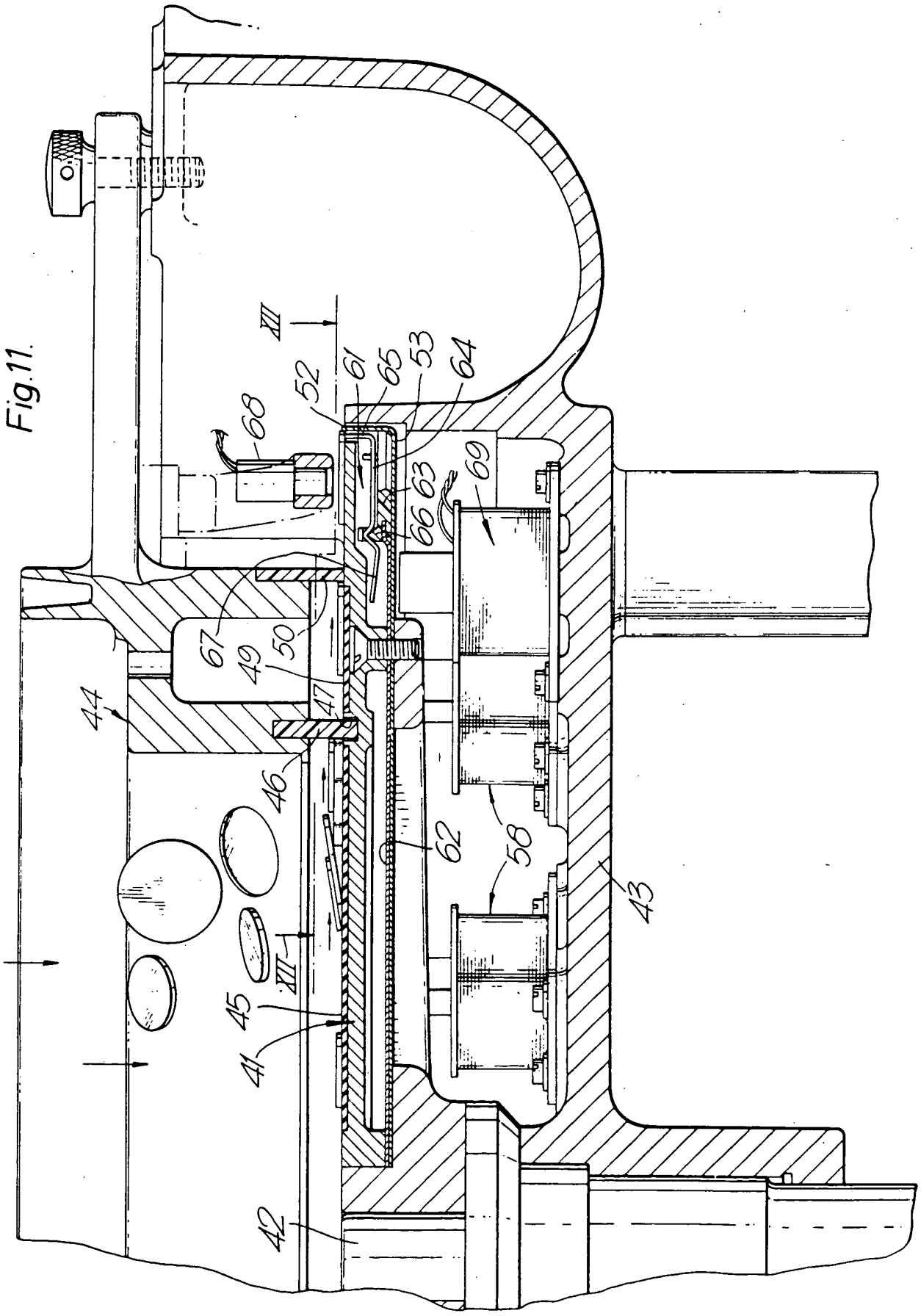


Fig.12.

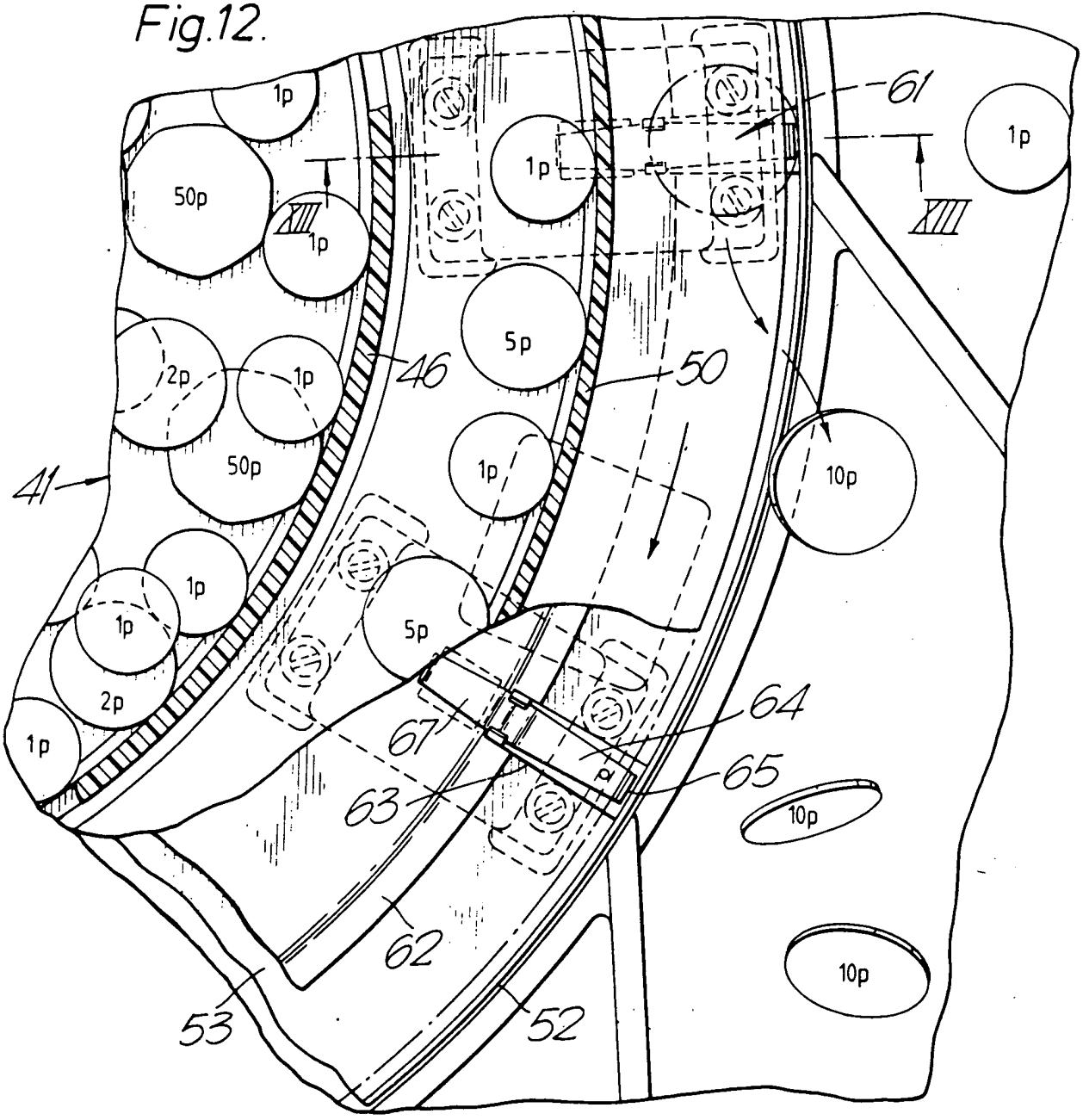

1p
50p
1p
1p
61
1p
XIII
XIII
5p
2p
1p
46
50
41
50p
1p
10p
1p
1p
5p
2p
64
1p
67
65
63
10p
62
10p
53
52

Fig.13.

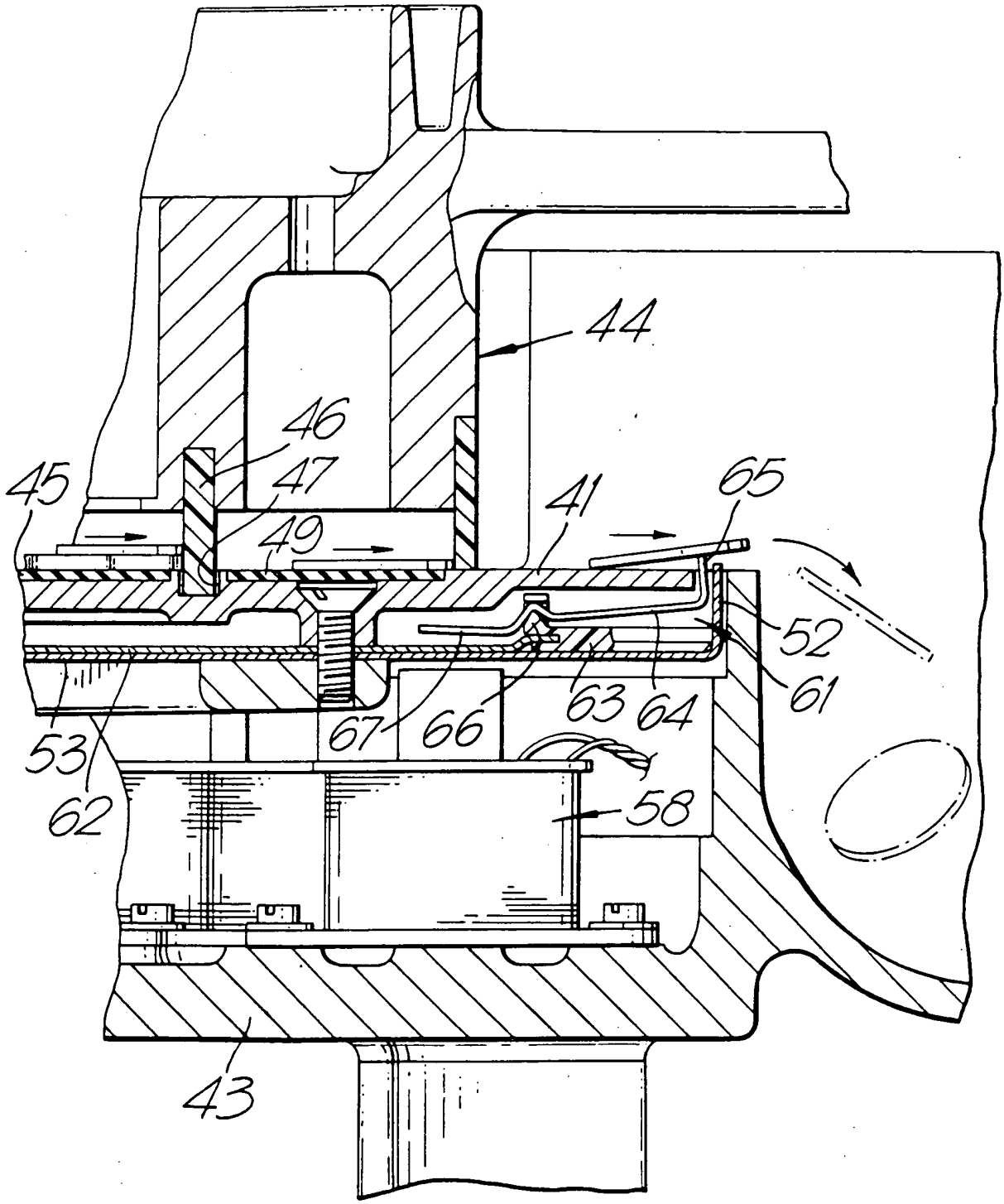


Fig. 14

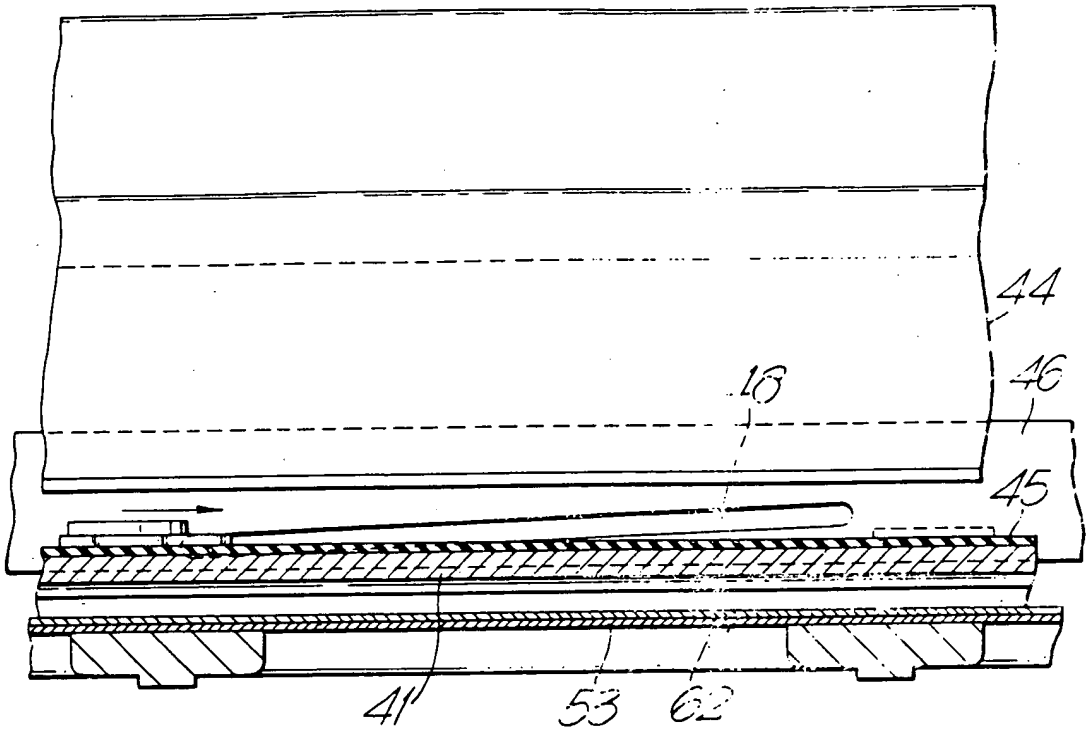
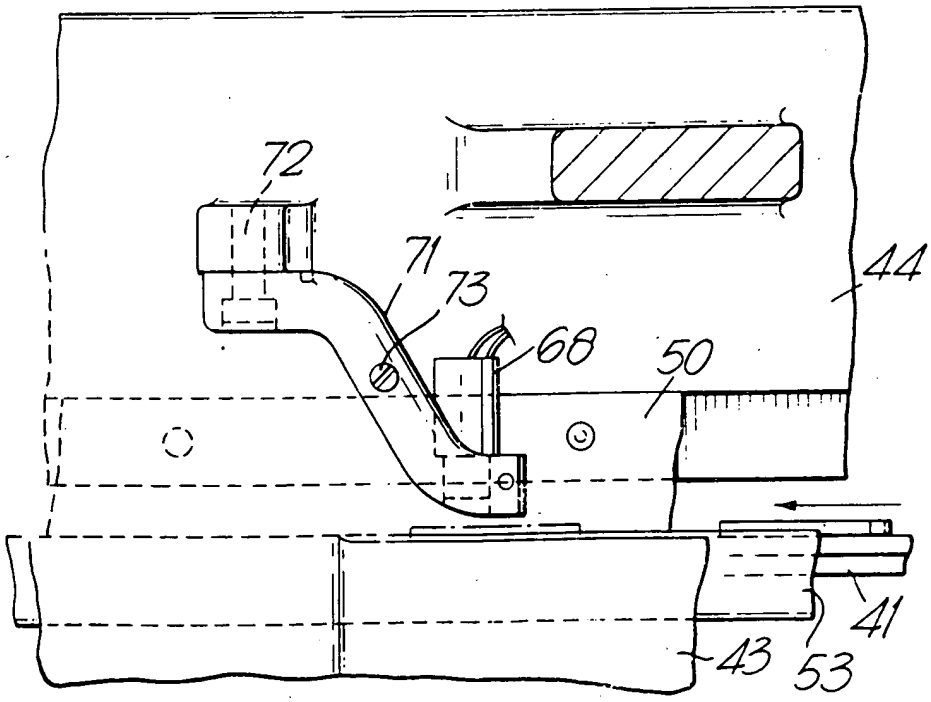


Fig. 15.



SPECIFICATION

Sorting and other selection of articles one from another

This invention relates to sorting and other selection of articles one from another.

The invention is especially concerned with sorting and other selection of coin, and the provision of apparatus for performing such operations.

According to one aspect of the present invention there is provided a method of sorting or other selection of articles one from another, comprising the steps of discharging the articles onto a rotating surface to be urged individually against an abutment that obstructs them from leaving the rotating surface, and selectively effecting deflection at a localized region of the surface such as to free any said article within that region from obstruction by the said abutment and enable it to pass from said surface.

According to another aspect of the present invention there is provided apparatus for sorting or other selection of articles one from another, comprising a rotatably-mounted member, means for rotating said member, means for discharging the articles onto a surface of the rotating member to be urged towards an abutment that obstructs the articles from leaving the rotating surface and means for selectively effecting deflection at a localized region of the surface such as to free any said article within that region from the said obstruction and enable it to pass from said surface.

The rotating surface of the method and apparatus of the present invention, may be provided by a disc that is mounted to rotate horizontally about a vertical axis, and although the abutment at the periphery of the disc may be provided by a stationary member relative to which the disc rotates, it preferably rotates as one with the disc.

The peripheral margin of the rotating surface may be provided by an annular element that is mounted with flexural freedom such as to enable any selected localized region of its periphery to be deflected sufficiently to lift an article lying within that region above the peripheral abutment. More particularly, the said element may be ferro-magnetic and in these circumstances a solenoid may be located adjacent the element for effecting selection of an article therefrom. Selection of an article may in these circumstances be effected by energization of the solenoid to produce transitory deflection of the ferromagnetic element at the region where the article to be selected lies, so that such deflection lifts that article free of the peripheral obstruction to pass from the rotating surface. The solenoid may be located above the surface to exert a transitory attractive force on the ferromagnetic element and thereby lift the article free of the obstruction directly upon the upward deflection of the element. On the other hand, where the ferromagnetic element has resilience, the solenoid may be located below the surface whereby upward deflection of the element to lift the article free of the peripheral obstruction occurs during the return overswing movement of the element following the transitory attractive force exerted by the solenoid.

Provision for localized deflection at the periphery of the rotating surface may be made in other ways. More particularly, a multiplicity of separate elements may be distributed around the peripheral margin of the surface and be actuable individually or in groups to project upwardly through a gap between the periphery of the rotating surface and the abutment, so as to lift any article lying there above the abutment and enable that article to leave the rotating surface. Actuation of the elements in this way may be achieved magnetically and more especially by transitory energization of one or more stationary solenoids.

The present invention according to a further aspect provides a method and arrangement for the separation of coins or other articles from one another in which relative movement between such coins or other articles and an abutment against which the coins or other articles are urged while lying on the surface, presents the coins or other articles to a slot in the abutment, such slot providing an aperture through the abutment which throughout an initial portion of its length in the direction of said movement of the coins or articles with respect to the abutment is open at the level of said surface to enable the coins or other articles to enter therein individually, and which throughout a subsequent portion of its length in said direction is spaced above said level so that only coins or other articles that have already entered into the aperture within its initial portion can enter this subsequent portion to complete passage through the abutment.

These and other aspects of the present invention will now be described, by way of example, with reference to two embodiments of the presents invention. These embodiments which are related specifically to the sorting of coin, will be described with reference to the accompanying drawings, in which:—

Figure 1 is a plan view of a first of the two coin-sorting machines in accordance with the present invention;

Figure 2 is a side elevation of the coin-sorting machine of Figure 1;

Figure 3 illustrates in side elevation a detail of the coin-sorting machine of Figures 1 and 2;

Figures 4 to 6 illustrate in side elevation successive stages in the selection of a coin at one of the coin-selection stations of the coin-sorting machine of Figures 1 and 2;

Figure 7 is a circuit diagram of a coin-sensor of the coin-sorting machine of Figures 1 and 2;

Figure 8 illustrates the relative location of light beams utilized for the detection of coin in the coin-sensor of Figure 7;

Figure 9 is a plan view of the second coin-sorting machine in accordance with the present invention;

Figure 10 is an enlarged plan view of part of the second coin-sorting machine of Figure 9;

Figure 11 is a sectional side elevation taken on the line XI—XI of Figure 10;

Figure 12 is a plan view taken on the line XII—XII of Figure 11 and partly broken away to show more clearly further detail of the coin-sorting machine of Figure 9;

Figure 13 is an enlarged sectional side-elevation taken on the line XIII—XIII of Figure 12 and illustrating selection of a coin at one of the coin-selection stations of the coin-sorting machine of Figure 9; and

Figures 14 and 15 are enlarged views in side elevation taken respectively in the directions of the arrows XIV and XV of Figure 9 to illustrate specific aspects of the coin-sorting machine of Figure 9.

Referring to Figures 1 and 2, an aluminium-alloy disc 1 is mounted horizontally on a vertical shaft 2 that is journalled in a base support 3 of the equipment. The shaft 2 is driven via a belt 4 by an electric motor 5 to rotate the disc 1 at high speed, in particular at some 80 to 120 revolutions per minute. Rotation of the shaft 2 is communicated to the disc 1 via a friction clutch 6.

A stainless-steel hopper 7 of the equipment extends below the disc 1, and any coin entered into the bottom of the hopper 7 is raised up over the disc 1 by an endless-belt elevator 9 that is driven by an electric stepping motor 10. Coin elevated in this way falls from the elevator 9 onto the disc 1 within an inner, annular region that is faced with a layer 11 of cold-rolled steel. This inner region is encircled concentrically by a stationary fence or wear strip 12 that is mounted from the base support 3, just clear of the layer 11. Each coin dropped onto the layer 11 from the elevator 9 is thrown outwardly on the rotating disc 1 into abutment with the strip 12, and is then drawn round with the disc 1 against the inner periphery of the obstructing strip 12 until a port 13 located beneath the elevator 9, is reached.

The port 13 is in the form of a wedge-shape aperture (see Figure 3) which extends throughout an arc of some forty degrees of the strip 12, and which provides a gap between the strip 12 and the disc 1 that increases progressively in height in the direction of disc rotation. The maximum height of the gap is adequate to allow the thickest coin to pass through, so each individual coin drawn around with the disc 1 against the strip 12 is in general no longer obstructed by the strip 12 and is free to move radially of the disc 1 beyond the strip 12, at some point within the aperture-arc of the port 13. The wedge shape of the port-aperture ensures separation of any coins that may be riding one upon the other, in that the upper coin will still be obstructed by the strip 12 after the lower coin has already become free to pass through the port 13; the lower coin will, in general, move outwardly through the port 13 from beneath the upper coin causing the upper coin to fall onto the disc 1 so as itself to become free to pass through the port 13 after the leading, lower coin has moved clear of it.

The disc 1 is inset beyond the strip 12 (see Figures 4 to 6) with a thin annular element 14 of resilient ferromagnetic material that projects outwardly and horizontally across a recess 15 to close upon an upstanding peripheral rim 16 of the disc 1. Accordingly, any coin passing through the port 13 free of the strip 12 moves rapidly outwardly across the element 14 on the rotating disc 1 to the rim 16. The rim 16 projects above the surface of the element 14 by an amount substantially less than the maximum coin thickness, and any bent or otherwise distorted coin reaching the rim 16 will in general pass over it adjacent to the elevator 9, to fall into the hopper 7; the same will occur to any coin which at this point may be riding on top of another. Outward movement of any other coin, however, is obstructed by the upturned rim 16 so that such coin continues to be carried round with the disc 1 retained on the element 14 against the rim 16 (as illustrated in Figure 4).

The outer margin of the disc 1 passes successively through four (there may be more or fewer) selection stations 17 in each revolution from the port 13. Each such station 17 (as illustrated in the case of only one such station shown in Figure 1) includes a coin-selector solenoid 18 located on the base support 3 beneath the disc 1 (see Figures 4 to 6), together with an electrical coin-sensor 19 mounted with the strip 12 above the disc 1 a little in advance of the solenoid 18 in the direction of disc rotation. The coin sensor 19 of each station 17 responds to the entry of a coin beneath it to discriminate in accordance with pre-set criteria between coins which are to be selected at that respective station 17 and those which are not. The sensor 19 energizes its associated solenoid 18 transitorily whenever a coin that is to be selected is detected. Energization of the solenoid 18 attracts (as illustrated in Figure 5) the region of the element 14 immediately above the solenoid 18, downwardly into the recess 15—for example by some 1 mm—so that when energization ceases that region springs up out of the recess 15 in returning to its normal horizontal alignment. The coin to be selected lies on this deflected region of the element 14, and so is deflected downwardly and then upwardly with the element 14 to be lifted (as illustrated in Figure 6) above the rim 16 in the upward overswing of the element 14. The coin thus becomes free of radial obstruction and thereby passes over the rim 16 from the disc 1 to be projected adjacent to the solenoid 18, into the individual outlet port 20 of the selection station 17.

Any coin not selected at any of the selection stations 17 passes round with the disc 1 towards the elevator 9 and may be returned to the hopper 7. To this end, a further sensor 21 and solenoid 22 are provided just in advance of the elevator 9 whereby any coin detected by the sensor 21 as remaining on the element 14 against the rim 16,

can be selected to be projected into the hopper 7 by appropriate transitory energization of the solenoid 22 from the sensor 21.

The sensor 21 may be identical to the sensors 19, and the nature and operation of the sensors 19 will now be described in further detail with reference to Figures 7 and 8.

Referring to Figure 7, each of the sensors 19 includes three phototransistors 23, 24 and 25 that are spaced from one another above the disc 1 to respond to the reflection of light from the disc 1. More especially, and as indicated in Figure 8, the phototransistors 23, 24 and 25 respond to light reflected from three points A, B and C respectively beneath them on the rotating disc 1 within the path of coin abutting the rim 16. Each phototransistor 23, 24 and 25 has an individually associated light-emitting diode 26, 27 and 28 that emits a narrow pencil-beam of light down onto the disc 1 at the respective point A, B or C for reflection back to that phototransistor. The diode in each case may conveniently be combined as one with its associated phototransistor, as illustrated, into a unitary device such as that sold by Hewlett Packard as the high resolution optical device HEDS 1000.

The signal outputs of the phototransistors 23, 24 and 25 are compared individually in amplifiers 29, 30 and 31 respectively with a reference-signal value pre-set at a potentiometer 32. The potentiometer 32 is set to provide for discrimination in each amplifier 29, 30 and 31 between the signal output of the respective phototransistor 23, 24 or 25 in response to uninterrupted reflection of light from the relevant point A, B and C on the disc 1, and the signal output of that phototransistor in response to interruption of such reflection from the relevant point A, B or C by the presence of a coin. The output signals of the amplifiers 29, 30 and 31 accordingly together signify which, if any, of the points A, B and C is occupied by a coin. It is from these signals in conjunction with the relative locations of the phototransistors 23, 24 and 25, and thereby of the points A, B and C, that discrimination between coins of different sizes is achieved for coin sorting.

The phototransistors 24 and 25 are so mounted (together with their respective light-emitting diodes 27 and 28) to provide (as illustrated in broken line in Figure 8) that a coin of the size to be selected is just clear of the point B and just covers the point C when the edge of that coin is passing through point A. The existence of this condition, namely of uninterrupted reflection from point B to the phototransistor 24 and interrupted reflection from the point C to the phototransistor 25 upon change from uninterrupted to interrupted reflection from the point A to the phototransistor 23, is exclusive to passage of coin of this specific size beneath the sensor. Response to such condition to energize the associated solenoid 18 and thereby bring about selection of the coin, is provided by a NAND gate 33. The gate 33 is supplied with a pulse signal derived by a differentiating circuit 34 from the output signal of the amplifier 29, and receives the output signals of the amplifiers 30 and 31 via an invertor 35 and directly respectively.

The two phototransistors 24 and 25 and their respective light-emitting diodes 27 and 28 are mounted for adjustment together relative to the phototransistor 23, to enable different sizes of coin to be selected. The mounting enables their location over the disc 1 to be adjusted together such that the points B and C move together along a line X (indicated in chain-dotted form in Figure 8) which extends from the foot on the rim 16 of the radius of the disc 1 through the point A, and which is inclined at an angle of 27 degrees to such radius. Preferably, but not essentially, the mounting of the phototransistors 24 and 25 also enables a small degree of rotational adjustment to be made to them together about an axis which is parallel to the rotational axis of the disc 1 and which intersects the 27-degree line.

The method of selection utilized in the coin-sorting machine described above has the especial advantage that it does not require the interaction of any mechanical device with the rotating disc 1 to remove the selected coin. Instead the selection is achieved simply through a transitory magnetic effect on the element 14 to bring about appropriate lifting of the coin to pass over the rim 16 of the disc 1. The degree to which the element 14 can be deflected by magnetic attraction to bring this about, and the extent to which such deflection is adequately localized to ensure selection of only one coin at a time, are dependent on the thickness and other dimensions of the element 14 and the properties of the ferromagnetic material used. It may be found advantageous to divide the element 14 radially into separate fingers projecting across the recess 15 in order to improve its characteristics in one or other of these respects. An alternative method and construction may, however, be utilized in which the resilient annular element 14 is replaced, and the lifting of the selected coin is achieved through the agency of ferromagnetic finger elements which are located beneath the upper surface of the disc and which pivot transitorily in response to applied magnetic field to tip any coin lying over them, momentarily, but sufficiently, to pass from the disc.

The coin-sorting illustrated in Figures 9 to 13 utilizes this alternative method and construction and will now be described.

Referring to Figures 9 to 13, an aluminum-alloy disc 41 is mounted horizontally on a vertical shaft 42 that is journalled in a base member 43 of the machine. The shaft 42 is driven by an electric motor (not shown) to rotate the disc 41 at high speed, in particular at 100 revolutions per minute.

An annular lid 44 is hinged to the base member 43 over the disc 41, and coin to be sorted is fed from a hopper (not shown) to fall through the open centre of the lid 44 onto the disc 41 within an inner, annular region that is faced with a layer 45 of rubber. This inner region

is encircled by a stationary fence or wear strip 46 that is carried by the lid 44 to project down into an annular slot 47 in the disc 41. Each coin dropped onto the layer 45 through the lid 44 is thrown outwardly on the rotating disc 41 into abutment with the strip 46 and is then drawn round with the disc 41 against the inner periphery of the obstructing strip 46 until a port 48 is reached.

The port 48, as illustrated in Figure 14, is in the form of a uniform-width slot that extends throughout the arc of some forty-five degrees of the strip 46 and which is inclined upwardly along its length in the direction of disc rotation from a first portion open at the level of the upper surface of the disc 41 to a second portion spaced above the disc surface. The width of the slot is adequate to allow the thickest coin to pass through, so each individual coin drawn round with the disc 41 against the strip 46 is in general no longer obstructed by the strip 46 and is free to pass through, or at least to enter, the port 48 at some point within the aperture-arc of the first portion of the slot. The limited width of the port-slot ensures separation of any coins that may be riding one upon the other, in that the upper coin will still be obstructed by the strip 46 after the lower coin has already become free to pass through the port 48. The lower coin will, in general, move outwardly through the port 48 from beneath the upper coin causing the upper coin to fall onto the disc 41, so as itself to become free to pass through the port 48 after the leading, lower coin has moved through it, either during the same of a subsequent revolution of the disc 41, depending upon the diameter of that coin. Furthermore, the limited length of the aperture provided at disc-level by the first portion of the inclined-slot port 48, reduces substantially the likelihood of those coins that lie on the disc 41 in triangular formation (with the two outer coins abutting the strip 46 and blocking outward movement to the strip 46, of the third) passing together in that formation through the port 48. The two outer coins will pass through the port 48 one after the other and in doing so, depending on their diameters, may even be tipped up slightly from the disc 41 as they reach the second portion of the slot where it rises clear of the disc surface. The inner, third coin will not however, reach the slot in time to enter the first portion and will therefore be carried round with the disc 41, blocked by the strip 46, until it reaches the port 48 again after another revolution of the disc 41.

Coins passing through the port 48 free of the wear strip 46 move rapidly outwards across an annular facing layer 49 of rubber, towards the periphery of the disc 41. Passage of each coin beyond the layer 49 is however obstructed for almost one whole revolution of the disc 41 by a further fence or wear strip 50. The strip 50, which is of flexible plastics material, extends downwardly to the disc 41 from around the outer periphery of the annular lid 44, being attached at one end near the root of an arm 51 that extends outwardly from the lid 44 just in advance of the port 48 in the direction of disc rotation, and at its other end to the extremity of the arm 51 just beyond the outer periphery of the disc 41. Coin is thus confined during almost one whole resolution of the disc 41 from the port 48 by the strip 50 which throughout its length nestles tightly to the outer periphery of the lid 44 until its runs outwardly to gain the extremity of the arm 51 and so guide the coins gradually to the periphery of the disc 41. The coins are obstructed from leaving the disc 41 by an upstanding rim 52 of a dished plate 53 of non-magnetic metal which is clamped to the underside of the disc 41, and which extends around, with a small spacing from, the periphery of the disc 41 to project slightly above the upper surface of the disc 41. Any coin, however, that at this stage is riding on top of another will not in general be obstructed by the rim 52 and will continue moving outwardly over the rim 52 to be collected in a chute 54 for return to the hopper; bent coins may also be removed from the disc 41 in the same way.

Coins obstructed by the rim 52 from leaving the disc 41 are carried round with the disc 41 in abutment with the rim 52 to pass first, after leaving the strip 50, under a rotating brush 55 mounted on the lid 44. The circular brush 55 bears on the surface of the disc 41 near the rim 52, and is driven in rotation from a rubber wheel 56 that runs on the layer 49, at the same angular velocity as the disc 41. This ensures that the coins passing successively from under the brush 55 are stationary on the disc 41, having been brought rapidly up to the peripheral speed of the disc 41 where necessary under the added influence of the rotating brush 55.

From the brush 55 the peripheral region of the disc 41 passes successively through eight selection stations 57 in each revolution back to the run-out of the strip 50. Each such station 57 includes a coin-selector solenoid 58 located on the base member 43 beneath the disc 41 (see Figures 11 and 13 especially), together with an electrical coin-sensor 59 mounted on the lid 44 above the disc 41 to project a little in advance of the solenoid 58 in the direction of disc rotation. The coin sensor 59 of each station 57 responds to the entry of a coin beneath it to discriminate in accordance with pre-set criteria between coins which are to be selected at that respective station 57 and those which are not. The sensor 59 energizes its associated solenoid 58 transitorily whenever a coin that is to be selected is detected, and this causes that coin to be lifted up above the rim 52 so freeing it from radial obstruction and allowing it to pass over the rim 52 and be projected into an outlet chute 60 individual to the relevant station 57.

The lifting of selected coins to pass over the upstanding rim 52 is achieved through the agency of a multiplicity of individual ejection units 61 which are carried on the underside of the disc 41 clipped to a non-magnetic plate 62 that is sandwiched between the disc 41 and the dished plate

53. The units 61, which each involve a plastics base 63 and an elongate ferromagnetic finger element 64 that extends radially of the disc 41, are mounted closely side-by-side with one another in even distribution around the entire underside of the peripheral margin of the disc 41. Each element 64 has an outer end 65 that is upturned to project slightly into the gap between the periphery of the disc 41 and the rim 52, and rests across, so as to be pivoted on, a ridge 66 of the respective base 63. The innermost end 67 of each finger element 64 is inclined upwardly and passes over the solenoids 58 in turn as the disc 41 rotates. Transitory energization of any solenoid 58 causes the innermost ends 67 of the one or two finger elements 64 then passing immediately over that solenoid 58 to be attracted downwardly. The relevant element or elements 64 pivot on the ridges 66 of their respective units 61 and thereby drive their upturned, outermost ends 65 to project through the gap between the periphery of the disc 41 and the rim 52 before returning to their normal withdrawn attitude again. Projection of the ends 65 of the one or two finger elements 64 through the gap in this way tips the coin lying over them, momentarily, but sufficiently, to clear the rim 52 as illustrated in Figure 13. Once clear of the rim 52 the coin passes across it to be projected cleanly from the rotating disc 41 into the port 60 of the respective selection station 57.

Any coin not selected at any of the selection stations 57 passes round with the disc 41 towards the run-out of the strip 50 and is returned to the hopper. To this end, a further sensor 68 and solenoid 69 are provided just in advance of the run-out of the strip 50. Coin detected by the sensor 68 as remaining on the disc 41 against the rim 52, can be selected to be projected into a chute 70 for return to the hopper, by appropriate transitory energization of the solenoid 69 from the sensor 68.

The method of selection utilized in the coin-sorting machine described above with reference to Figures 9 to 15, (like that of the machine described with reference to Figures 1 to 8) does not require the interaction of any mechanical device with the rotating disc to remove the selected coin. Instead the selection is achieved simply through a transitory magnetic effect to bring about appropriate lifting of the coin to pass over the rim 52 from the disc 41. This enables the selection of coin at any station 57 to be precisely controlled and in particular stopped immediately during a batching operation when the required number of coins for the batch total desired, has been selected.

The sensing and discrimination between different coins carried out by the coin-sensors 59 may be based simply on coin diameter. In this respect the sensors 59, and the sensor 68 too, may each involve a device (such as sold by Hewlett Packard as the high resolution optical device HEDS 1000) that incorporates a light-emitting diode along with a phototransistor to emit a narrow pencil-beam of light down onto the disc 41 for reflection back to the phototransistor. A coin passing through the beam interrupts momentarily the light-return to the phototransistor, and this momentary interruption, depending upon the threshold set by the spacing of the beam from the rim 52, can be utilized to signal that a specific diametral threshold for selection has been satisfied by the coin. Adjustment of the spacings to set the threshold relevant to the respective selection station 57 can be achieved by means of pivotal movement of the coin sensor 59 at that station. More especially, each coin sensor 59 is carried on a pivotable arm 71 and can be adjusted in angular position, and therefore spacing from the rim 52, over the disc 41 by means of a grub screw (not shown) that bears on the periphery of the annular lid 44; once the adjustment is made the arm 71 is secured in that position by tightening of its pivot fixing 72. An identical adjustable mounting is provided, as illustrated in Figure 15, for the sensor 68, the sensor 68 being carried on a further arm 71 that has a pivot fixing 72 and an adjustment screw 73 (also illustrated in Figure 10) to bear on the periphery of the lid 44.

It is preferred, especially with the form of sensing described above, that coins are selected at the successive stations 57 to progressively decreasing diametral thresholds so that the coins of largest diameter are selected first and those of smallest diameter last. This however is not essential, and may be otherwise as indeed illustrated in the accompanying drawings.

Claims

1. A method of sorting or other selection of articles one from another, comprising the steps of discharging the articles onto a rotating surface to be urged individually against an abutment that obstructs them from leaving the rotating surface, and selectively effecting deflection at a localized region of the surface such as to free any said article within that region from obstruction by the said abutment and enable it to pass from said surface.

2. A method according to Claim 1 wherein the said deflection is effected by deflecting said region of the surface to lift the article within that region free of, so as to pass over, the abutment.

3. A method according to Claim 2 wherein the lifting of the article occurs as the resilient, upward overswing from downward deflection of said region.

4. A method according to Claim 1 wherein the abutment is spaced by a gap from the periphery of said surface and said deflection is effected by causing one or more elements to project through said gap within the relevant region such as to tip any said article within that region free from obstruction by the abutment.

5. A method according to Claim 4 wherein the said one or more elements are selected elements from a multiplicity of such elements that are carried to rotate with said surface.

6. A method according to any one of Claims 1

to 5 wherein said deflection is effected electromagnetically.

7. A method according to any one of Claims 1 to 6 wherein said rotating surface is provided by a horizontal member that is mounted to rotate about a vertical axis.

8. A method according to any one of Claims 1 to 7 wherein the said articles are coins.

9. Apparatus for sorting or other selection of articles one from another, comprising a rotatably-mounted member, means for rotating said member, means for discharging the articles onto a surface of the rotating member to be urged towards an abutment that obstructs the articles from leaving the rotating surface and means for selectively effecting deflection at a localized region of the surface such as to free any said article within that region from the said obstruction and enable it to pass from said surface.

10. Apparatus according to Claim 9 wherein said member is a horizontal disc that is mounted to rotate about a vertical axis.

11. Apparatus according to Claim 10 wherein said abutment is an upstanding peripheral rim of the disc.

12. Apparatus according to any one of Claims 9 to 11 wherein the peripheral margin of the rotating surface is provided by an annular element that is mounted with flexural freedom with respect to said abutment, and wherein said means for effecting deflection is operable to deflect any selected localized region of the element sufficiently to free any said article lying within that region from obstruction by said abutment.

13. Apparatus according to Claim 12 wherein said element is ferromagnetic and the means for effecting deflection is electromagnetic means which is stationary with respect to the rotating surface and which is energizable to exert a deflecting force on a localized region of the element transitorily.

14. Apparatus according to Claim 13 wherein the said element responds resiliently to the transitory deflection force such that the article is freed from obstruction by the abutment during the return overswing movement of the element.

15. Apparatus according to any one of Claims 9 to 11 wherein the periphery of said surface is spaced by a gap from the abutment, and said means for effecting deflection is operable to actuate one or more elements to project transitorily through said gap within a localized region to tip any said article within that region free from obstruction by the abutment.

16. Apparatus according to any one of Claims 9 to 11 wherein a multiplicity of elements which are distributed around the peripheral margin of said surface are actuable individually or in groups within a localized region to project through a gap between the periphery of the rotating surface and the abutment, so as to lift any said article lying in that region above the abutment and enable that article to leave the rotating surface.

17. Apparatus according to Claim 15 or Claim 16 wherein each said element is actuated electromagnetically.

18. Apparatus according to any one of Claims 15 to 17 wherein each said element is a pivotally-mounted finger element that pivots when actuated to project through said gap, and wherein a multiplicity of said finger elements are carried with said member side-by-side around the entire peripheral margin of said surface.

19. Apparatus for separation of articles one from another wherein it is arranged that relative movement between said articles and an abutment against which the articles are urged while lying on a surface, presents the articles to a slot in the abutment, such slot providing an aperture through the abutment which throughout an initial portion of its length in the direction of said movement of the articles with respect to the abutment is open at the level of said surface to enable the said articles to enter therein individually, and which throughout a subsequent portion of its length in said direction is spaced above said level so that only said articles that have already entered into the aperture within its initial portion can enter this subsequent portion to complete passage through the abutment.

20. Apparatus according to any one of Claims 9 to 18 including separation apparatus according to Claim 19.

21. Apparatus according to any one of Claims 9 to 20 adapted for sorting coin.

22. Apparatus for sorting coin substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.

23. Apparatus for sorting coin substantially as hereinbefore described with reference to Figures 9 to 15 of the accompanying drawings.

24. A method of sorting coin substantially as hereinbefore described with reference to Figures 1 to 6 of the accompanying drawings.

25. A method of sorting coin substantially as hereinbefore described with reference to Figures 9 to 15 of the accompanying drawings.

26. A method according to Claim 22 or Claim 23 utilizing apparatus according to any one of Claims 21 to 23.

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